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CIRCUIT ARRANGEMENT FOR ATTENUATING RELAXATION OSCILLATIONS
[Schaltungsanordnung zur Daempfung von Kippschwingungen]

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Circuit Arrangement for Attenuating Relaxation Oscillations

The invention concerns a circuit arrangement used for attenuating relaxation oscillations in three-phase power systems with isolated neutral point and single-ended inductive voltage transformers.

The coaction of non-linear transformer impedances and ground capacities in three-phase power systems with isolated neutral point and low expansion, that is, low capacity to ground, in which single-ended inductive voltage transformers are used can cause stationary relaxation oscillations. The relaxation oscillations can be excited by connections or disconnections, such as, for example, the connection of a bus bar or a voltage transformer replacement, or through single-pole transient earth fault. The voltage transformers work then widely in saturation mode as a consequence of the voltage increases, wherefrom erroneous measurements and, with linear stress, a thermal destruction of the voltage transformer results.

In a known circuit arrangement for suppressing relaxation oscillations in voltage transformers, resistances of a specific size are built into the secondary circuit for the conductor earth potentials; for this reason, the zero point should be relocated after the electric neutral point of the voltage triangle.

This known circuit arrangement produces difficulties with regard to the selection of the resistances. This is ascribed to the fact that not only do 100 Hz and 50 Hz relaxation oscillations occur, but also in general 25 Hz relaxation oscillations. While a resistance with a relatively low consumption is sufficient to suppress the 100 Hz and 50 Hz relaxation oscillations and can therefore remain connected also in the case of a ground leak, the 25 Hz oscillations can only be suppressed by means of a resistance with high consumption; this resistance cannot remain connected in the case of a permanent ground leak, because the high current over this resistance would destroy the transformer over time (burning of the transformer winding).

For this reason, it is not possible to achieve a satisfactory suppression of the relaxation oscillations with a resistance that is permanently active in the secondary circuit of voltage transformers without endangering the transformer.

The disadvantages of this known circuit arrangement are eliminated namely with another known circuit arrangement by accommodating dischargers, but these dischargers are disadvantageous as long as they do not cause difficulties during the measurement; the dischargers alone are therefore not sufficient to suppress the relaxation oscillations.

Also a suppression of the relaxation oscillations by means of voltage-dependent (non-linear) resistances is not satisfactory, since a compromise has to be made as a consequence of the requirement that a transformer be only weakly stressed in the normal case, on the one hand, and that the shock absorbing element be also able to withstand the ground leak, on the other hand.

It can therefore be determined that the known circuit arrangements for suppressing relaxation oscillations work unsatisfactorily.

A circuit arrangement is created in order to obtain improvements, in which, according to the invention, a resistance is connected in series to the auxiliary windings of the inductive voltage transformer in the open triangle, which becomes active in the presence of relaxation oscillations by means of the activated contacts of three relays via the auxiliary windings, and wherein, of

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the relays, respectively one relay is arranged in series with a further winding of another voltage transformer.

Even though it is already known that the residual voltage or zero voltage can be measured on the secondary windings of inductive voltage transformers connected in the open triangle, it has still not been realized that relaxation oscillations can be suppressed by means of a resistance connected to these secondary windings without

endangering the transformer in the case of a ground leak, when the resistance becomes active by means of actuated contacts of three relays, of which respectively one relay is arranged in series with a further winding of a voltage transformer.

In the circuit arrangement according to the invention, the contacts of the three relays can all be connected in series to the resistance within the electric circuit of the auxiliary windings of the inductive voltage transformer; however, it is also possible to connect the contacts of two relays in series to the third relay, and to only arrange the contact of the third relay in series with the resistance located within the electric circuit of the auxiliary windings. This last embodiment of the circuit arrangement of the invention is advantageous as long as only the contact of the third relay can be stressed for the correspondingly high current, which flows via the resistance, while the contacts of the two other relays merely need to withstand the operating current for the third relay. As a consequence, only the third relay of the circuit arrangement according to the invention can be configured like a contactor.

The invention will be described in more detail with reference to the exemplary embodiments shown in the drawings in Figs. 1 and 2.

In Fig. 1, the three-phase power system consisting of the conductors R, S, and T with isolated neutral point is respectively connected to a voltage transformer WR, WS, and WT. The voltage

transformer has the primary windings wr_1, ws_1, and wt_1, which are grounded and connected in the star, as well as the secondary windings wr_2, ws_2, and wt_2, which are likewise connected in the star, and which are connected to the usual device M for measuring and counting, as well as for protection. In addition, the relays RR, RS, RT are connected to these secondary windings wr_2, ws_2, and wt_2. Each one of the three voltage transformers WR, WS, and WT has an auxiliary winding wr_3, ws_3, and wt_3; the auxiliary windings are connected in the open triangle and are located over the work contacts rr, rs, and rt of the relay RR, RS, and RT, which are connected in series one after the other to the resistance R.

In the normal operation case of the three-phase power system R, S, T, the relays RR, RS, and RT connected to the secondary windings wr_2, ws_2, and w_2 are excited and their work contacts rr, rs, and rt, which are connected within the electric circuit of the auxiliary windings wr_3, ws_3, wt_3 located in the open triangle, are closed. In this way, the resistance R is connected to the auxiliary windings wr_3, ws_3, wt_3 in the open triangle, but is inactive, since no voltage occurs in the normal case where the triangle circuit is open.

If relaxation oscillations occur, instead, a voltage U, which produces a current caused by the attenuation of the relaxation oscillations that flows over the resistance R, is then produced at the auxiliary windings wr_3, ws_3, and wt_3 of the inductive voltage

transformer WR, WS, and WT, since the relays RR, RS, and RT are excited and in this way their working contacts rr, rs, and rt are closed.

As was explained in the introduction of the specification, it must be ensured that the resistance R located in the electric circuit of the auxiliary windings is switched off in order to prevent the thermal destruction of the voltage transformer when ground leaks occur. This is achieved in the circuit arrangement according to the invention in that as a consequence of a breakdown that occurs in the presence of a ground leak, any existing voltages of at least one of the three relays RR, RS, or RT is excited, whereby one of the three working contacts rr, rs, or rt connected in series to the resistance R is opened; the electric circuit over the auxiliary windings wr_3, ws_3, and wt_3 is then interrupted and the resistance R is inactive.

A further exemplary embodiment of the circuit arrangement according to the invention is shown in Fig. 2, in which the circuit parts that correspond to those shown in Fig. 1 have been provided with the same reference numerals. In this exemplary embodiment, the three relays RR, RS, and RT are also connected to the secondary windings wr_2, ws_2, and wt_2 of the inductive voltage transformers WR, WS and WT. The contact rr, rs, and rt of the three relays RR, RS, and RT are not all arranged within the electric circuit of the auxiliary windings wr_3, ws_3, and wt_3 connected in the open triangle,

however, but the working contacts rr and rs of the relays RR and RS are connected in series, for example, to the relay RT. This is advantageous insofar as the strong current flows through the resistance R only over the contact rr of the relays RT in the presence of relaxation oscillations, while the contacts rr and rs are merely stressed by the relatively weak current through the relay RT. For this reason, only the contact rr of the relays RT can be stressed with a high current, so that merely the relay RT must be configured as a protection, but the two remaining relays RR and RS, instead, can be configured as normal relays.

Since the mode of operation of the circuit arrangement according to the invention shown in this exemplary embodiment coincides with the exemplary embodiment shown in Fig. 1, reference is made to the previous corresponding sections of the disclosure in order to avoid repetitions.

Patent Claims

1. A circuit arrangement for the attenuation of relaxation oscillations in which three-phase power systems with isolated neutral point and single-ended inductive voltage transformers are used, wherein a resistance is connected in series to the auxiliary windings of the inductive voltage transformer in the open triangle, which becomes active in the presence of relaxation oscillations by means of the activated contacts of three relays via the auxiliary windings,

and wherein, of the relays, respectively one relay is arranged in series with a further winding of another voltage transformer.

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2. The circuit arrangement of claim 1, wherein the contacts of the relay are connected in series to the resistance.

3. The circuit arrangement of claim 1, wherein the contacts of two relays are connected in series to the third relay, whose contacts are connected in series to the resistance.

<u>Cited Literature</u>

1. German ALS no. 1055 681;

2. Neugebauer, Selectivschutz (Selective Protection), Berlin 1958, p. 17;

3. Walter, Current and Voltage Transformers, Munich, 1937, p. 122, 123;

4. ETZ-A, Vol.80/4, 1959, p. 108 to 112;

5. CIGRE Report of the year 1946, no. 107, p. 3.

1 sheet of drawings in enclosed

Fig. 1

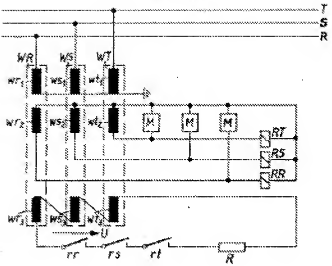
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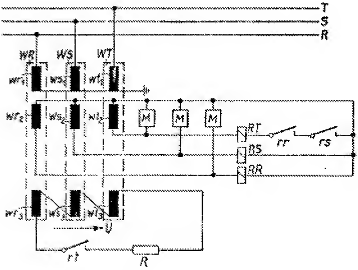
Fig. 2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